UFMG UNIVERSIDADE FEDERAL DE MINAS GERAIS

EFFECT OF A TENSEGRITY-BASED VEST ON THE HUMAN POSTURE AND MOVEMENT

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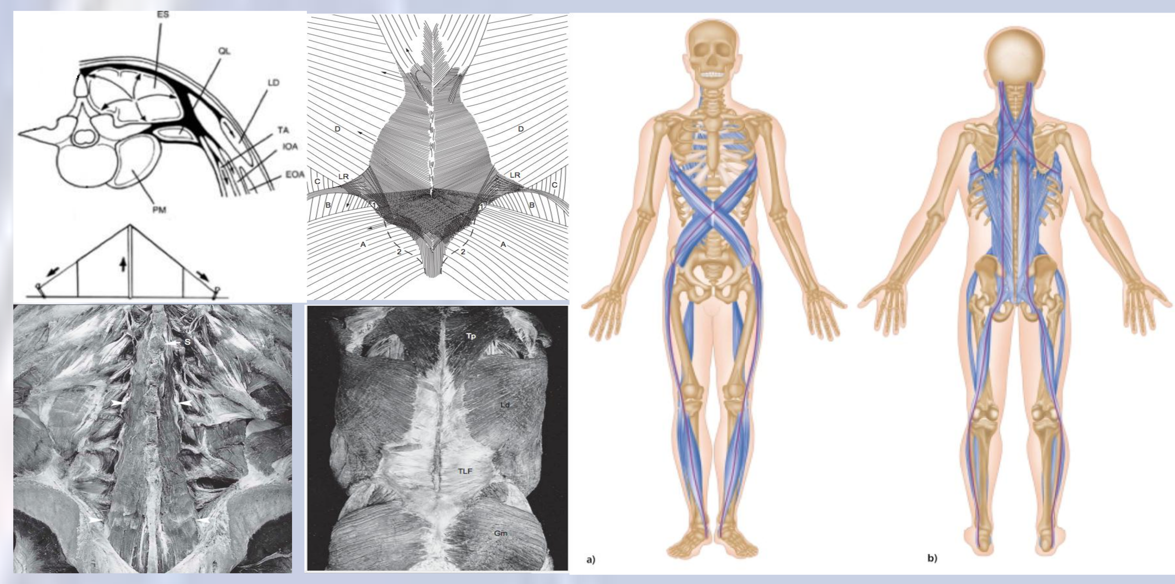
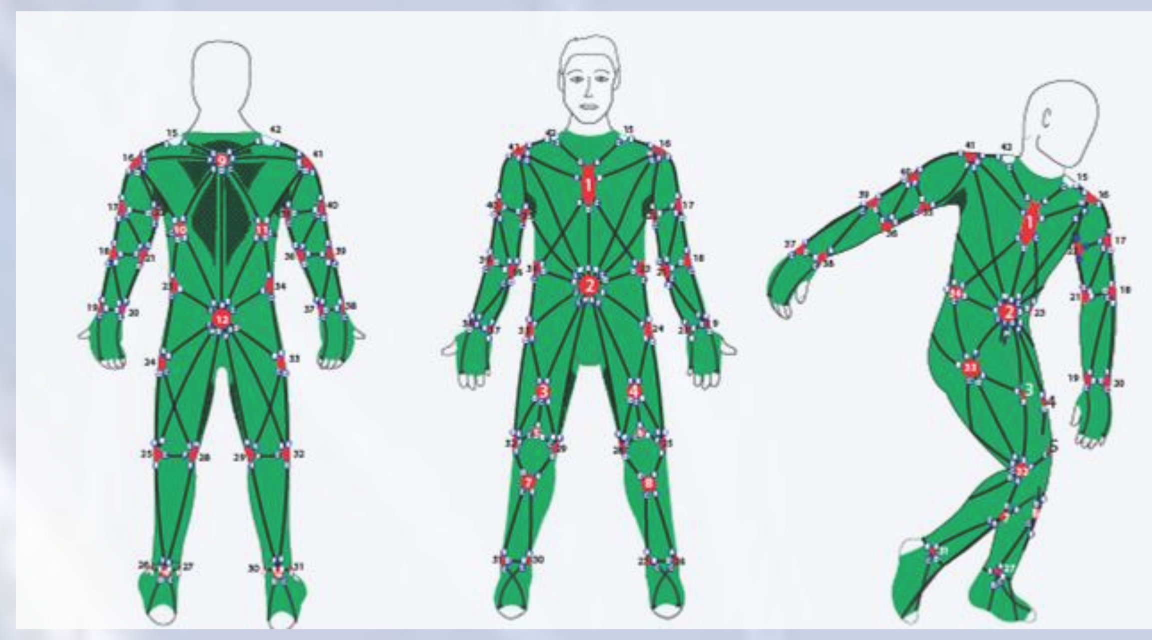
Introduction

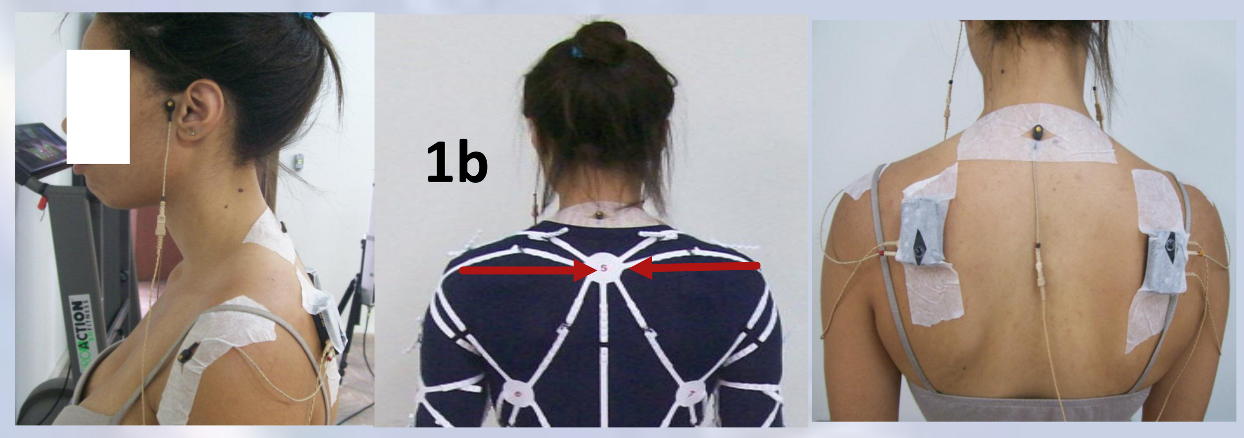
Within the musculoskeletal (MS) system there are extensive connections between muscles, capsules and ligaments, which supports the existence of myofascial force transmission (Carvalhais et al., 2013). In addition, the architecture of the MS system suggests that it shares several features of tensegrity structures (Chen & Ingber, 1999). Following the idea that the MS system is a continuous, tensegrity-like structure, a tensegrity-based suit was developed. This suit was biologically inspired and designed as a tool to optimize posture and movement. The objective of this study was to investigate the effect of the tensegrity-based suit on posture and on the kinematics of the knee and hip joints.

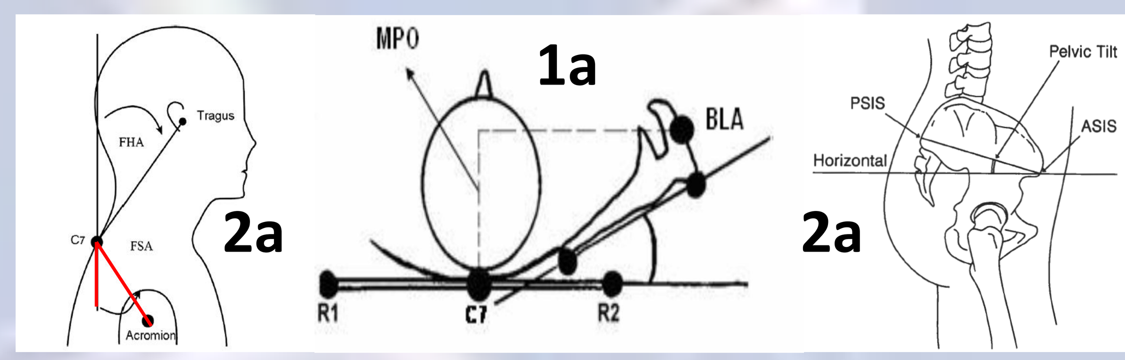


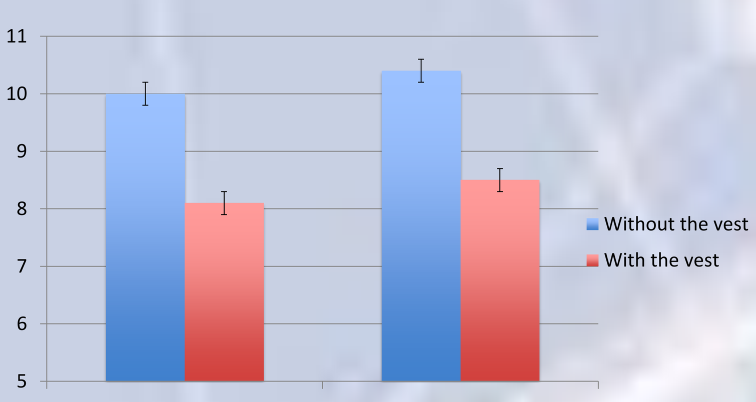


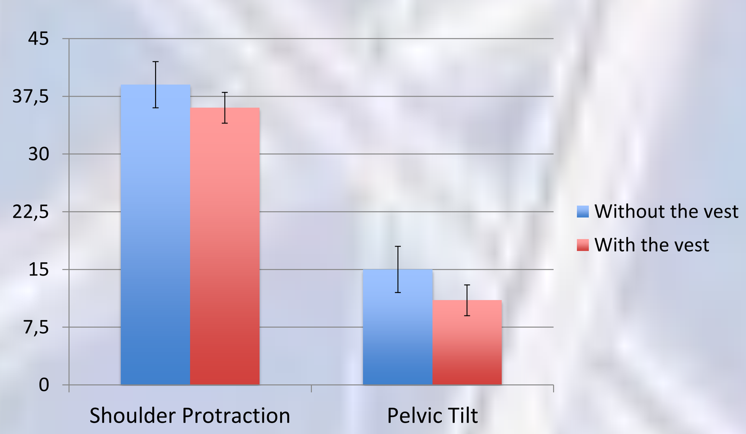
Methods

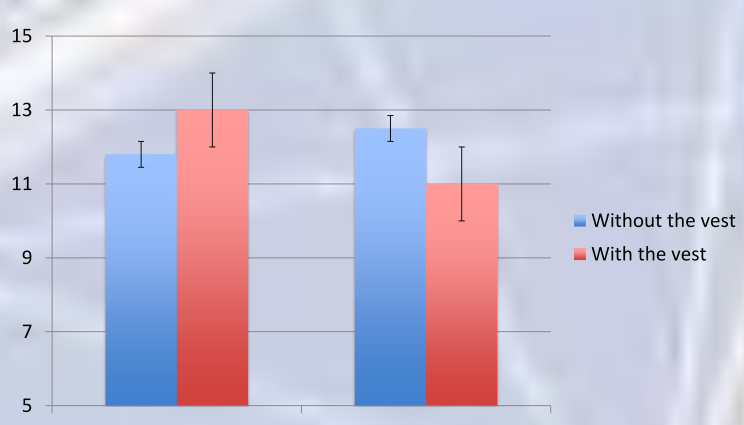
Shoulder protraction, pelvic tilt and 3D hip and knee angular kinematics were assessed in 10 healthy adults, with and without the use of the vest. Initially, the subjects had their posture (1a and 2a) and lower limb movement pattern (3a) evaluated by means of a 3D motion analysis system, during quiet standing and during single leg squatting, respectively. Further, the volunteers wore the vests, which were adjusted to produce scapular retraction (1b), pelvic posterior tilt (2b) and lateral hip rotation (3b), and the measurements were repeated. Dependent t-tests compared shoulder protraction, pelvic tilt and hip and knee angular motion on the sagittal and transverse planes, between the conditions with and without the vest.











Results

There was a significant reduction in shoulder protraction of the right and left shoulders ($p \leq 0.001$) caused by the scapular retraction (1b) produced by the vest. Pelvic posture manipulation (2b) also decreased shoulder protraction ($p = 0.04$) and pelvic tilt ($p = 0.02$). In addition, the vest significantly reduced medial rotation of the hip ($p = 0.04$) and increased lateral rotation of the knee ($p = 0.04$).

Conclusion

The tensegrity-based vest was effective in modifying posture and movement, by reducing head and shoulder protraction, pelvic tilt and controlling internal rotation of the lower limb. These effects are often the objective of rehabilitation programs designed to treat and/or prevent injuries. The vest increased the individuals' dynamic resources and enabled them to better deal with postural and task demands.

References

Carvalhais, V. O., Ocarino, J. D., Araujo, V. L., Souza, T. R., Silva, P. L., & Fonseca, S. T. (2013). Myofascial force transmission between the latissimus dorsi and gluteus maximus muscles: An in vivo experiment. *J Biomech*, 46, 1003-1007.

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